图形点阵液晶显示模块使用手册

TSG240128C 系列

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产品描述

TSG240128C 系列图形点阵液晶显示模块是一款带中文字库的显示产品，基于SMD电子装配工艺及液晶模组制造工艺，内置RA8803控制器；模块可以文本、图形方式显示，还能实现双图层合成显示（“或”“同或”“异或”“与”）和四阶灰度显示。文本模式下可以实现大小字体的混编（最大字体为64X64），具有中英文自动对齐功能。模块外引线CN1端口为22脚2.54间距焊盘。另外还有CN2端口1 ~ 16脚外引线是用来连接外部控制器（controll LSI）的焊盘。

- 自带控制器RA8803 .
- 内嵌简体中文字库（7602个汉字）.
- 点大小0.40mmx0.40mm, 点间距0.04mm。
- 性能稳定
- 可带对比度自动调节功能，可附带温度补偿电路。
- 典型工作典雅 3.3V---5V。
- -20℃——70℃宽工作范围。
- 可以任选STN正显(灰色或黄绿色), STN蓝膜负显(蓝底白字),FSTN 正显(白底黑字)。
- 支持4/8位数据6800/8080 MCU介面

机械尺寸和特性

Item	Normal Dimensions(mm)	Feature	
模块尺寸(L×W×T)	144.0× 104.0×13.0MAX	LCD 显示类型	STN 黄绿 蓝色负显、FSTN 灰白
显视区域(L×W)	114.0×64.0	LCD 显视屏颜色	STN:蓝色 FSTN:Gray
显视点阵	240x128	视角	6 0’ clock
点间距(L×W)	0.45 × 0.45	显示方式	正显、负显
点大小 (L×W)	0.40× 0.40	偏光片类型	全透、半反半透
占空比	1/128	工作温度	-20℃~70℃
偏压比	1/12.3	背光类型	LED 白色 、黄绿色、蓝色等.

电气参数

(V_{DD} = +5V±5% , V_{SS} = 0V, Ta = 25° C)

Characteristics	Symbol	Condition	Min.	Typ	Max.	Unit
工作电压	V_{DD}	--	3.3	5.0	5.5	V
工作电流	I_{DD}	--	--	5.7	10.0	mA
液晶驱动电压	V_{LCD}	25° C☆	18.2	18.5	18.8	V
输入最高电压	VIH	--	0.7VDD	--	VDD	V
输入最低电压	VIL	--	0	--	0.3VDD	V
背光功耗	If	25° C,V=5V	--	120.0☆	--	mA

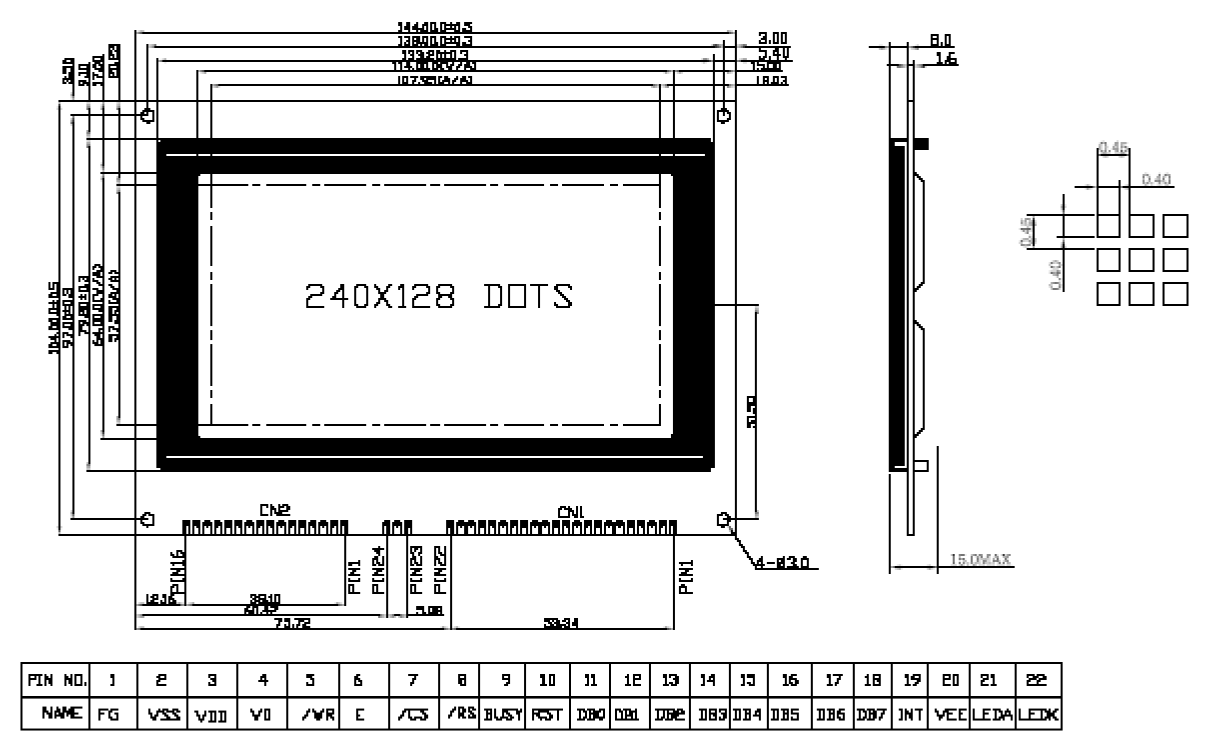
☆ 不同温度下的操作电压会有漂移。

☆ 标准配置的模块型号可以在订货信息里看到，如果需要特别的配置，请联系特晶业务部和技术部.

极限参数

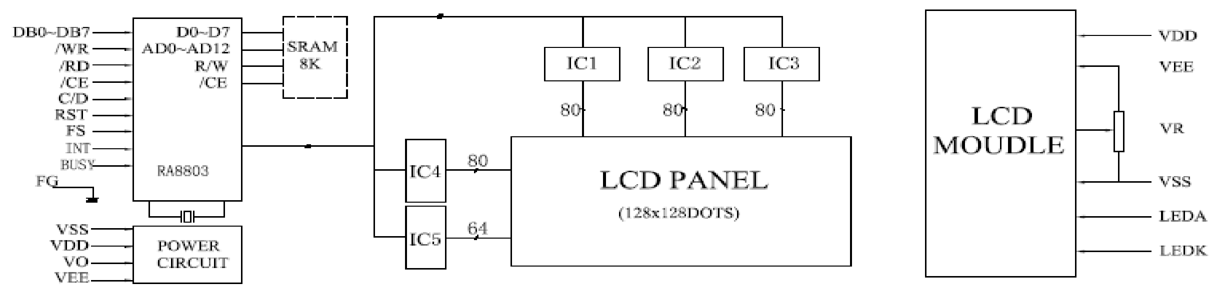
Charicteristic	Symbol	Value	Unite	Note
Operating voltage	V_{DD}	-0.3~5.5	V	Base on Vss=0V
Supply negative voltage	V_{EE}	V_{DD}-33.0~V_{DD}+0.3	V	
Operating voltage for LCD	V_{LCD}	V_{EE}-0.3~ V_{DD}+0.3	V	
Logic driver voltage	V_B	-0.3~V_{DD}+0.3	V	
Operating tempration	T_{OPR}	-20~70	℃	
Storage tempration	T_{STG}	-30~80	℃	

外形尺寸



PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
NAME	FG	VSS	VDD	V0	/WR	E	/CS	/RS	BUSY	RST	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	INT	VEE	LEDA	LEDK

内部方块图



For TSG240128C01,contrast can be adjust by a potentiometer on LCM back

白色背光源电气参数

Item	Symbol	WHITE			Unit	Condition
		MIN.	TYP.	MAX.		
Forward Voltage	Vf	2.9	3.1	3.3	V	If=15X10mA
Forward Current	If		150	200	mA	
Reverse Current	Ir			100	μA	Vr=4V
Peak wave length	λP				nm	If=15X6mA
Spectral Line Half width	Δλ				nm	If=15X6mA
Luminance	Lv	105	150		Cd/m^2	If=15X6mA

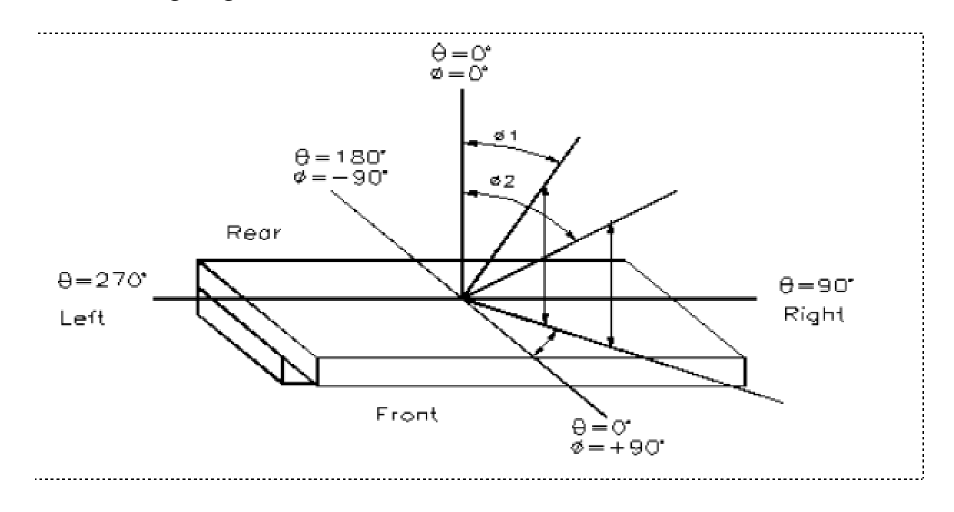
黄绿色背光源电气参数

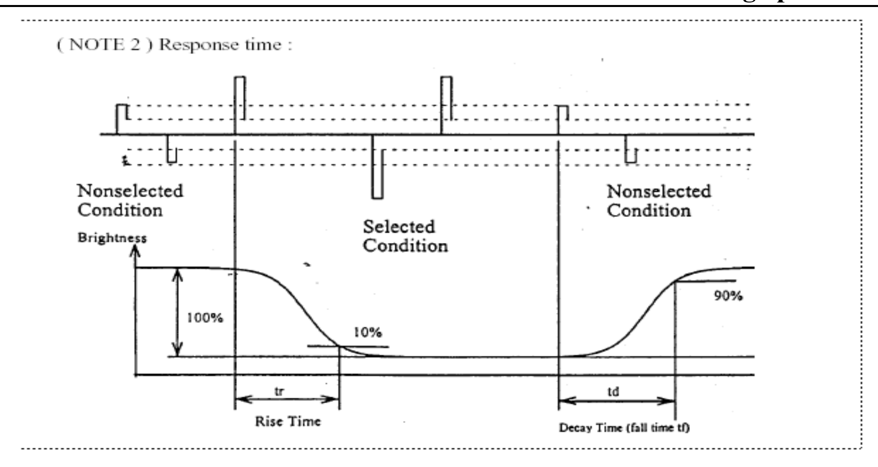
Item	Symbol	BLUE			Unit	Condition
		MIN.	TYP.	MAX.		
Forward Voltage	Vf	2.8	3.0	3.2	V	If=15X12mA
Forward Current	If		170	230	mA	
Reverse Current	Ir			100	μA	Vr=4X8V
Peak wave length	λP	470		475	nm	If=15X8mA
Spectral Line Half width	Δλ		20		nm	If=15X8mA
Luminance	Lv	35	60		Cd/m^2	If=15X8mA

光电响应特性(T_a=25℃ V_{DD}=5.0±0.25V VOP=12.5V)

ITEM	SYMBOL	CONDITION	MIN	TYPE	MAX	UNIT
VIEW ANGLE	ΔΦ	Ø=0^0,Cr≥2 -90^0<Φ1, Φ2<90	35	40	---	Deg
CONTRAST	Cr	Φ=0^0, Ø=0^0	4	10	---	-
RESPONSE TIME	tr(rise)	Φ=0^0, Ø=0^0	-	250	300	ms
	tf(fall)	Φ=0^0, Ø=0^0	-	300	350	ms
Frame Frequency		25℃		64		Hz

NOTE1:Definition of Viewing Angle Φ, θ





接口引脚功能定义

CN1 PIN NO.	SYMBOL	LEVEL	FUNCTION
1	FG		外壳地
2	Vss	0V	电源地
3	Vdd	+5V	电源
4	V0		液晶屏驱动电压（带有自动对比度功能的可以不用）
5	/WR	L/H	写控制线，低电平有效
6	/RD	L/H	读控制线，低电平有效
7	/CS	L	片选信号线，低电平有效
8	C/D	L/H	命令/数据，高电平位数据，低电平为指令
9	BUSY	----	控制器忙信号
10	RST	L/H	复位线，低电平有效
11-18	DB0-DB7	L/H	数据线
19	NC		不用
20	VOUT		负电压输出
21	SLA	+5V	背光源输入(+)
22	SLK	0V	背光源输入(-)
CN2 PIN NO.	SYMBOL	LEVEL	FUNCTION
1	D0	--	Data output for even columns
2	D1	--	Data output for even columns
3	D2	--	Data output for even columns
4	D3	--	Data output for even columns
5	FLM	--	Synchronous signal for row driver
6	M	--	Frame signal
7	LP	--	Latch pulse for column driver.
8	CP	--	Shift clock pulse for column driver of upper area of LCD
9	NC		NOT CONNECT
10	VDD		Power Ground
11	VSS		Power supply
12	V0		LCD Operating Voltag

13	VOUT		Negtive Voltage Supply
14	SLA	+5V	Power supply for LED(+)
15	SLK	0V	Power supply for LED(-)

暫存器總表

REG [00h] LCD Controller Register (LCR)

Bit	Description	Text/Graph	Default	Access
7-6	電源模式(**Power Mode**) **11**：正常模式(**Normal Mode**) **RA8802** 的所有功能都可以使用(**Available**)。 **10**：等待模式(**Standby Mode**) 只有 **DDRAM** 與 **ROM** 的存取功能被禁止，其他功能都可以使用，**LCD** 亦照常工作。 **01**：睡眠模式(**Sleep Mode**) 除了允許暫存器的讀寫外，其他 **LCD** 顯示與 **DDRAM**、**ROM** 的存取將被禁止。 **00**：關閉模式(**Off Mode**) 除了喚醒(**Wake-Up**)電路工作外，其他功能都被禁止。當 **Wake-Up** 電路被觸發，**RA8802** 將進入正常模式。	--	11h	R/W
5	軟體重置 所有暫存器回到初始值，但是 **RAM** 的內容不會被清除。 **1**：重置所有暫存器 **0**：無作用	--	0h	R/W
4	設定自動重置功能 當此位元處於致能(設為 **1**)時，若 **RA8802** 無法在 **2** 毫秒內得到一完整指令或資料時，則 **RA8802** 會忽視這個指令或資料。 **1**：致能自動重置功能 **0**：禁能自動重置功能	--	0h	R/W

3	選擇顯示工作模式 **1**：文字模式，寫入的資料會被視為是 **GB/BIG/ASCII** 等字碼。 **0**：繪圖模式，寫入的資料會被視為是 **Bit-Map** 的模式。	--	1h	R/W
2	設定螢幕顯示為開啟或關閉 ,此位元用來控制連接到 **LCD** 驅動 **IC** 介面的**"DISP_OFF"** 信號 **1**：**"DISP_OFF"** 信號輸出 **High** **0**：**"DISP_OFF"** 信號輸出 **Low**	Text/Graph	0h	R/W
1	閃爍模式選擇 **1**：整個螢幕閃爍，閃爍時間由暫存器**[80h]BTR** 來設定 **0**：正常顯示	Text/Graph	0h	R/W
0	螢幕反白模式選擇 **1**：正常顯示 **0**：全螢幕反白顯示，**DDRAM** 內的資料會被全部反相。	Text/Graph	1h	R/W

REG [10h] Cursor Control Register (CCR)

Bit	Description	Text/Graph	Default	Access
7	游標自動移位設定，此 **Bit** 用來設定當資料讀出 **DDRAM** 時，游標是否自動移位。 **1**：致能 **0**：禁能	Text/Graph	1h	R/W
6	中/英文字對齊 **1**：致能 **0**：禁能 此功能僅在文字模式時有效，可以將全形與半形混合顯示時作對齊調整。	Text	1h	R/W
5	儲存當前資料(正相/反相)於 **DDRAM** **1**：直接儲存資料於 **DDRAM** 中 **0**：存入相反的資料於 **DDRAM** 中	Text	1h	R/W

4	設定粗體字型(僅文字模式適用) **1**：粗體字型 **0**：正常字型	Text	1h	R/W
3	游標自動移位設定，此 **Bit** 用來設定當資料寫入 **DDRAM** 時，游標是否自動移位，如果此位元被 **Enable**，則不論在文字或是繪圖模式，游標都會自動移位。 **1**：致能 **0**：禁能	Text/Graph	0h	R/W
2	游標顯示 **On/Off** 設定 **1**：設定游標 **On** **0**：設定游標 **Off**	Text/Graph	0h	R/W
1	游標閃爍控制 **1**：游標閃爍，閃爍時間由暫存器[80h]BTR 來決定 **0**：游標不閃爍	Text/Graph	0h	R/W
0	設定游標寬度 **1**：會隨著輸入的資料而變動游標寬度，當資料為半型時，游標為一個位元組寬度(8 個 Pixel)，當資料為全型時，游標為二個位元組寬度(16 個 Pixel)。 **0**：游標固定為一個位元組的寬度(8 個 Pixel)	Text	0h	R/W

REG [20h] Active Window Right Register (AWRR)

Bit	Description	Default	Access
7-6	保留	0h	R
5-0	設定工作視窗(**Active window**)右邊位置 → **Segment-Right**	表 6-1	R/W

Note：REG [20h, 30h, 40h, 50h] 可作為換行/換頁的功能，可讓使用者利用這4個Register自行設定一個區塊為工作視窗。當資料超過視窗的右邊界REG [20h, 30h, 40h, 50h]所設定的值，游標會自動換行(也就是游標會回到工作視窗的左邊界REG[40h]所設定的值)，繼續將資料寫入。當資料寫入到工作視窗的右下角時（REG[20h and 30h]所設定的值），會自動把游標移到工作視窗的的左上角(REG[40h, 50h]所設定的值)，繼續的將資料填入視窗。

REG [30h] Active Window Bottom Register (AWBR)

Bit	Description	Default	Access
7-0	設定工作視窗(**Active window**) 底邊位置→ **Common-Bottom**	表 6-1	R/W

REG [40h] Active Window Left Register (AWLR)

Bit	Description	Default	Access
7-6	保留	0h	R
5-0	設定工作視窗(**Active window**)左邊位置 → **Segment-Left**	0h	R/W

REG [50h] Active Window Top Register (AWTR)

Bit	Description	Default	Access
7-0	設定工作視窗(**Active window**) 頂邊位置 → **Common-Top**	0h	R/W

REG [60h] Cursor Position X Register (CPXR)

Bit	Description	Default	Access
7-6	保留	0h	R
5-0	設定游標 **Segment** 位址	0h	R/W

REG [70h] Cursor Position Y Register (CPYR)

Bit	Description	Default	Access
7-0	設定游標 **Common** 位址	0h	R/W

REG [80h] Blink Time Register (BTR)

Bit	Description	Text/Graph	Default	Access
7-0	游標閃爍時間設定 閃爍時間 = **Bit[7..0] x (1/Frame_Rate)** **Frame_Rate** 的設定是通常依照 **LCD** 面板所提供的最佳值。	Text/Graph	23h	R/W

REG [90h] Shift Clock Control Register (SCCR)

Bit	Description	Default	Access
7-0	設定 **XCK** 訊號週期 SCCR = (SCLK * DBW) / (Column * Row * FRS) **SCLK：RA8802** 系統頻率**(System Clock) (**單位：**Hz)** **DBW：LCD Driver** 的 **Data Bus** 寬度**(**單位：**Bit)** **Column：LCD** 面板的 **Segment** 大小**(**單位：**Pixel)** **Row：LCD** 面板的 **Common** 大小 **(**單位：**Pixel)** **FRS：LCD** 面板的 **Frame Rate(**單位：**Hz)**	--	R/W

REG [A0h] Interrupt Setup & Status Register (INTR)

Bit	Description	Default	Access
7	忙碌狀況指示 **1：RA8802** 為忙碌狀態，**MCU** 需暫時等候到忙碌狀態終止。 **0：RA8802** 為閒置狀態，隨時可接受 **MCU** 存取。	0h	R
6	觸控螢幕偵測 **1：**觸控螢幕有偵測到接觸**(Touch)** **0：**觸控螢幕未偵測到接觸	0h	R
5	游標行**(Column)**狀態 **1：**游標的 **Column** 等於暫存器**[B0h]INTX** **0：**游標的 **Column** 不等於暫存器**[B0h]INTX**	0h	R
4	游標列**(Row)**狀態 **1：**游標列等於暫存器**[B8h]INTY** **0：**游標列不等於暫存器**[B8h]INTY**	0h	R
3	忙碌中斷遮罩 **1：**致能 **BUSY** 去產生中斷輸出 **0：**禁能 **BUSY** 去產生中斷輸出	0h	R/W
2	觸控螢幕中斷遮罩 **1：**如果觸控螢幕被偵測到，則產生中斷輸出。 **0：**如果觸控螢幕被偵測到，則不產生中斷輸出。	0h	R/W

1	暫存器[B0h]INTX 是否發生中斷 1：致能 INTX 中斷 0：禁能 INTX 中斷	0h	R/W
0	設定暫存器[B8h]INTY 是否發生中斷 1：致能 INTY 中斷 0：禁能 INTY 中斷	0h	R/W

REG [B0h] Interrupt Column Setup Register (INTX)

Bit	Description	Default	Access
7-6	保留	0h	R
5-0	設定行 (Column) 位址中斷 假如游標位置 X 暫存器(CPXR)=INTX，中斷發生。	27h	R/W

REG [B8h] Interrupt Row Setup Register (INTY)

Bit	Description	Default	Access
7-0	設定列 (Row) 位址中斷 假如游標位置 Y 暫存器(CPYR)=INTY，中斷發生。	EFh	R/W

REG [C0h] Touch Panel Control Register (TPCR)

Bit	Description	Default	Access
7	觸控螢幕功能啓動 1：禁能 0：致能	1h	R/W
6	觸控螢幕資料輸出 1：禁能觸控螢幕資料輸出 0：致能觸控螢幕資料輸出	1h	R/W
5	保留	0h	R/W
4	觸控狀態 1：觸控未發生	1h	R

	0：觸控發生		
3-0	觸控螢幕控制位元 Bit3 = 0 → Switch SW3 OFF, Bit3 = 1 → Switch SW3 ON Bit2 = 0 → Switch SW2 OFF, Bit2 = 1 → Switch SW2 ON Bit1 = 0 → Switch SW1 OFF, Bit1 = 1 → Switch SW1 ON **Bit0 = 0 → Switch SW0 OFF, Bit0 = 1 → Switch SW0 ON**	圖 6-6	R/W

REG [C8h] Touch Panel Data Register (TPDR)

Bit	Description	Default	Access
7-0	儲存觸控螢幕的行、列相對位置資料	0h	R

REG [D0h] LCD Contrast Control Register (LCCR)

Bit	Description	Default	Access
7	**LCD** 亮度控制 **1**：禁能 **0**：致能	1h	R/W
6	**DAC** 寫入致能 **1**：不允許 **MCU** 把資料寫入 **Bit[4..0]** **0**：允許 **MCU** 把資料寫入 **Bit[4..0]**	1h	R/W
5	重置 **LCD** 亮度調整控制功能 **1**：正常操作 **0**：**DAC** 重置，設定 **Iout** 為 **0μA**	1h	R/W
4-0	設定 **LCD** 亮度控制 **Iout** 值 **00000b → 0μA (Min. Current)** ： ： **11111b → 500uA (Max. Current)**	0h	R/W

REG [E0h] Pattern Data Register (PDR)

Bit	Description	Text/Graph	Default	Access

7-0	設定寫入到 **DDRAM** 的資料 當暫存器**[F0h]**的 **bit3** 為‘**1**’，**RA8802** 內部將自動讀取本暫存器**[E0h]** 的 **Data**，然後全部填寫到 **DDRAM** 內，之後暫存器**[F0h]**的 **bit3** 被清除為‘**0**’。	Graph	0h	R/W

REG [F0h] Font Control Register (FCR)

Bit	Description	Text/Graph	Default	Access
7	字型 **ROM** 的轉換 **1**：致能 **0**：禁能	--	1h	R/W
6	內部/外部字型 **ROM** 選擇 **1**：選擇外部字型 **ROM** **0**：選擇內部字型 **ROM**	--	0h	R/W
5-4	字型 **ROM** 的語系選擇 **01**：選擇繁體（**BIG5**）字型 **10**：選擇簡體（**GB**）字型	--	00h	R/W
3	重複寫入 **REG [E0h]**的資料到 **DDRAM** **1**：開始寫入 **0**：未動作	Graph	0h	R/W
2	文字碼的類別選擇 **1**：輸入 **ASCII** 碼，輸出為符號等 **0**：輸入 **GB/BIG5** 碼，輸出為中文字	Text	0h	R/W
1-0	**4** 種 **ASCII** 區塊選擇 **0 0**：**ASCII** 選擇區塊 **0** **0 1**：**ASCII** 選擇區塊 **1** **1 0**：**ASCII** 選擇區塊 **2** **1 1**：**ASCII** 選擇區塊 **3**	--	00h	R/W

REG [08h] Misc. Register (MIR)

Bit	Description	Default	Access
7	保留	0h	--
6	**CLK_OUT** 致能控制 **1**：致能 **0**：禁能	1h	R/W
5	切換視窗模式 **1**：工作視窗 **(Active window)** **0**：顯示視窗 **(Display window)**	0h	R/W
4	設定中斷（**INT**）和忙碌位元（**Busy Polarity**）的準位 **1**：設定高電位動作 **0**：設定低電位動作	0h	R/W
3-2	保留	0h	R
1-0	時脈選擇 **0 0**：**1MHz** **0 1**：**2MHz** **1 0**：**4MHz** **1 1**：**8MHz**	00h	R/W

REG [18h] Cursor Size Control Register (CSCR)

Bit	Description	Text/Graph	Default	Access
7-4	設定游標高度 （預設值是 **2**）	Text	0010h	R/W
3-0	設定行距	Text	0010h	R/W

REG [28h] Display Window Right Register (DWRR)

Bit	Description	Default	Access
7-6	保留	0h	R/W

5-0	設定顯示視窗(Display Window)右邊位置 → **Segment-Right** **Segment_ Right = (Segment Number / 8) – 1** 如果 **LCD Panel** 為 **320x240**，則此暫存器的值為： **(320 / 8) – 1 = 39 = 27h**	0h	R/W

Note：REG[28h, 38h, 48h, 58h]是用來設定顯示視窗。使用者可設定顯示 RAM（DDRAM）的視角範圍，行的位址可設在 0~39 之間，而列的位址可設在 0~239 之間。使用者可先設定起使位址後，然後以增加位移的功能來達到文字轉動的效果。

REG [38] Display Window Bottom Register (DWBR)

Bit	Description	Default	Access
7-0	設定顯示視窗(Display Window) 底邊位置 → **Common_Bottom** **Common_Bottom = LCD Common Number –1** 如果 **LCD Panel** 為 **320x240**，則此暫存器的值為： **240 – 1 = 239 = EFh**	表 6-1	R/W

REG [48] Display Window Left Register (DWLR)

Bit	Description	Default	Access
7-0	設定顯示視窗(Display Window) 左邊位置 → **Segment-Left** 通常將此暫存器的值設定為 **"00h"**。	0h	R/W

REG [58] Display Window Top Register (DWTR)

Bit	Description	Default	Access
7-0	設定顯示視窗(Display Window) 頂邊位置 → **Common-Top** 通常將此暫存器的值設定為 **"00h"** 。	0h	R/W

Note：暫存器的設定，請遵照以下的規範：

1. AWRR≧CPXR≧AWBR, AWRR≧INTX≧AWBR
2. AWLR≧CPYR≧AWTR, AWLR≧INTY≧AWTR

TSG240128C 內含 9.6Kbyte 的 Display Data RAM，儲存要顯示在 LCD 面板上的每一圖元(Pixel)資料，MCU 從匯流排讀寫資料於 RAM 的時間非常短，而且可以在資料寫入 RAM 的同時，也顯示在螢幕上，此時螢幕並不會有閃爍不定的狀況發生。此外，亦可達到使用者對於文字與繪圖模式並存狀態的需求，達到同時顯示文字與圖形的應用功能。

軟件設定：使用者可以透過設定暫存器的方式，來更改對應的顯示器大小。可利用顯示視窗(Display Window) REG[28h, 38h, 48h, 58h]和工作視窗(Active Window)REG[20h, 30h, 40h, 50h]，來改變對顯示器大小的設定。

字型 ROM

TSG240128C 內建有 512KByte 的 16x16 中文顯示字型 ROM(Font ROM)與 8x16 的 ASCII 半型字型，儲存 7602 個標準 GB 碼的簡體中文及 ASCII CODE。同時也提供額外的介面可支援一外掛的 512KByte 字型 ROM，讓使用者的顯示字型多一倍。

*如果需要外挂显存，请在定购 TSG240128C 时特别说明，特晶的一般型号将不带此项功能。

DAC 功能

TSG240128C 內建了一個定電流輸出的 5-bit 數位-類比轉換器(Digital to Analog Converter, DAC)，使用者可以利用這個 DAC 產生不同的電流輸出，進而控制外部的升壓電路，使得供給 LCD Panel 高壓的電壓準位隨著 DAC 的設定值而改變，這樣透過 MCU 就可以達到用程式的方法去控制 LCD 的亮度。

***如果需要此项功能，请在定购 TSG240128C 时特别说明，特晶的一般型号将不带此项功能。**

ADC 功能

TSG240128C 预留 4 线接口，控制器內建了一個 8-bit 類比-數位轉換器(Analog to Digital Converter, ADC)及類比開關(Analog Switch)，使用者可以將四線電阻式觸摸式面板的 XL, XR, YU, YD 接到 TSG240128C 側面接口上，然後利用類比開關切換讓 ADC 讀取電阻上的電壓值，再由 MCU 讀回觸摸面板 Touch 的位置。

中斷(Interrupt)與忙碌(Busy)設定

TSG240128C 提供一中斷信號線(INT)用來表示有三種中斷訊息可能發生：

- 假如游標 Segment 位址暫存器(CPXR)與 Segment 中斷位址暫存器(INTX)值相同，發生中斷。
- 假如游標 Common 位址暫存器(CPYR)與 Common 中斷位址暫存器(INTY)值相同，發生中斷。
- 觸控螢幕偵測到被 Touch，發生中斷。

這三種中斷都可以單獨被致能或禁能，而中斷的設定與中斷訊息可有由暫存器[A0h] INTR 來控制與讀取。此外 TSG240128C 提供一忙碌(Busy)信號線，用來表示內部 DDRAM 與 ROM 的存取狀態是否因 Busy 而暫時無法接收 MCU 來的 Command，當忙碌旗標 (Busy Flag) 為 “1” 時，表示 TSG240128C 正處於忙碌狀態，此時 TSG240128C 無法存取 DDRAM 的資料，但仍然能接受讀寫暫存器的指令。此 BUSY Pin 通常與 MCU 的 I/O 端連接，MCU 在對 TSG240128C 做存取前可以先判斷 TSG240128C 是否可以接受存取動作。

省電模式

TSG240128C 的電源工作模式分四級：正常模式(Normal Mode)，等待模式(Standby Mode)，省電模式(Sleep Mode) ，關閉模式(Off Mode)，請參考暫存器內容描述之暫存器[00h]LCR 說明。

ASCII 區塊選擇設定

TSG240128C 內建四個 ASCII 區塊，包含許多文字、特殊符號或圖形可供使用者直接取用，

此功能可以由暫存器[F0h]的 bit1~0 來設定。如果使用者需要特殊符號或圖形，亦可經由

調整 ROM Code 來建立。

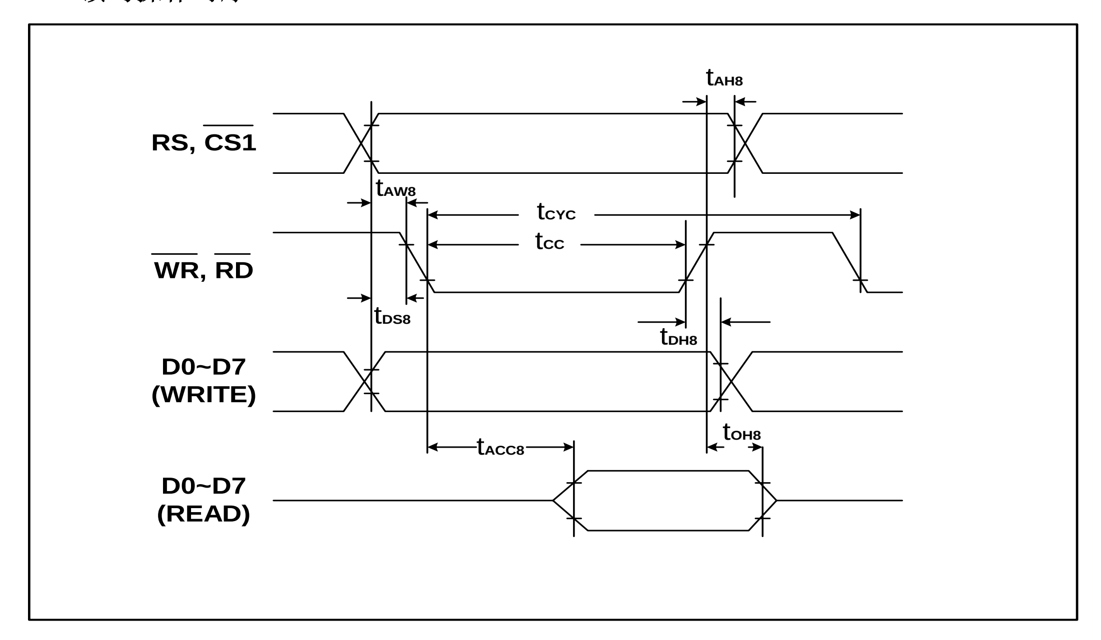
时序图

8080 系列的 MCU 介面

1、 接口时序表

Signal	Symbol	Parameter	Rating		Unit	Condition
			Min	Max		
RS, CS1#	t_{AH8}	Address hold time	10	--	ns	System Clock: 8MHz Voltage: 3.3V
	t_{Aw8}	Address setup time	63	--	ns	
WR#, RD#	t_{CYC}	System cycle time	800	--	ns	
	t_{CC}	Strobe pulse width	400	--	ns	
D0 to D7	t_{DS8}	Data setup time	63	--	ns	
	t_{DH8}	Data hold time	10	--	ns	
	t_{ACC8}	RD access time	--	330	ns	
	t_{OH8}	Output disable time	10	--	ns	

2、 CPU 读写操作时序



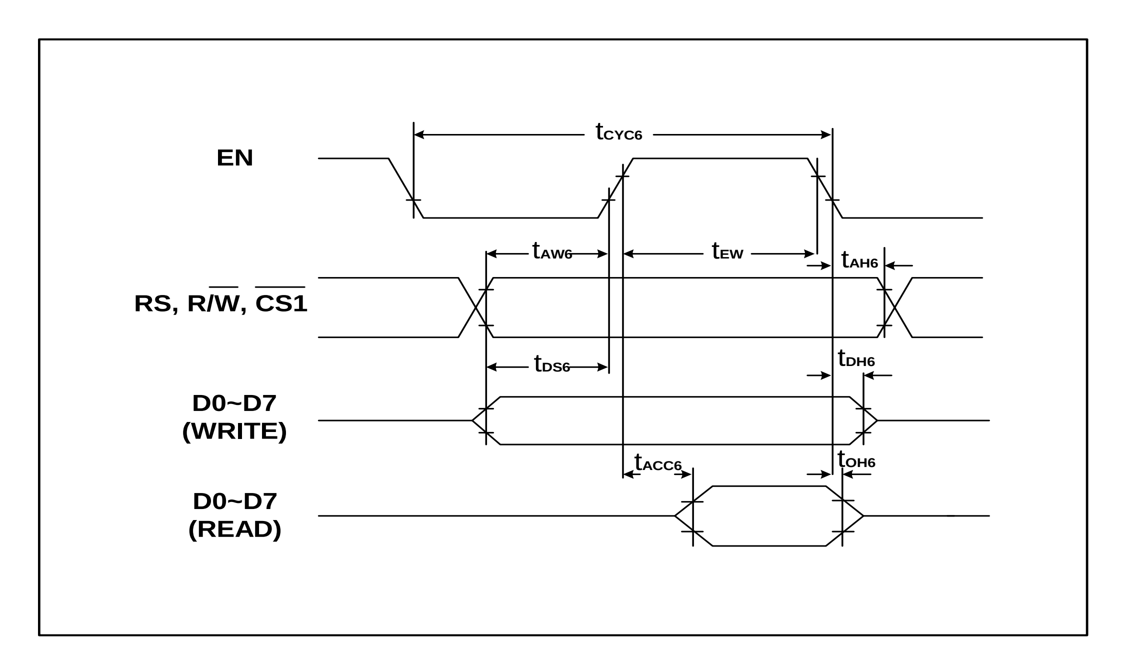
6800 系列的 MCU 介面

1、 接口时序表

Signal	Symbol	Parameter	Rating		Unit	Condition
			Min	Max		
A0, R/W#, CS1#	t_{AH6}	Address hold time	10	--	ns	System Clock: 8MHz Voltage: 3.3V
	t_{Aw6}	Address setup time	63	--	ns	
	t_{CYC6}	System cycle time	800	--	ns	
D0 to D7	t_{DS6}	Data setup time	63	--	ns	

	t_{DH6}	Data hold time	10	--	ns	
	t_{ACC6}	Access time	--	330	ns	
	t_{OH6}	Output disable time	10	--	ns	
EN	t_{EW}	Enable pulse width	400	--	ns	

2、 **CPU 读写操作时序**



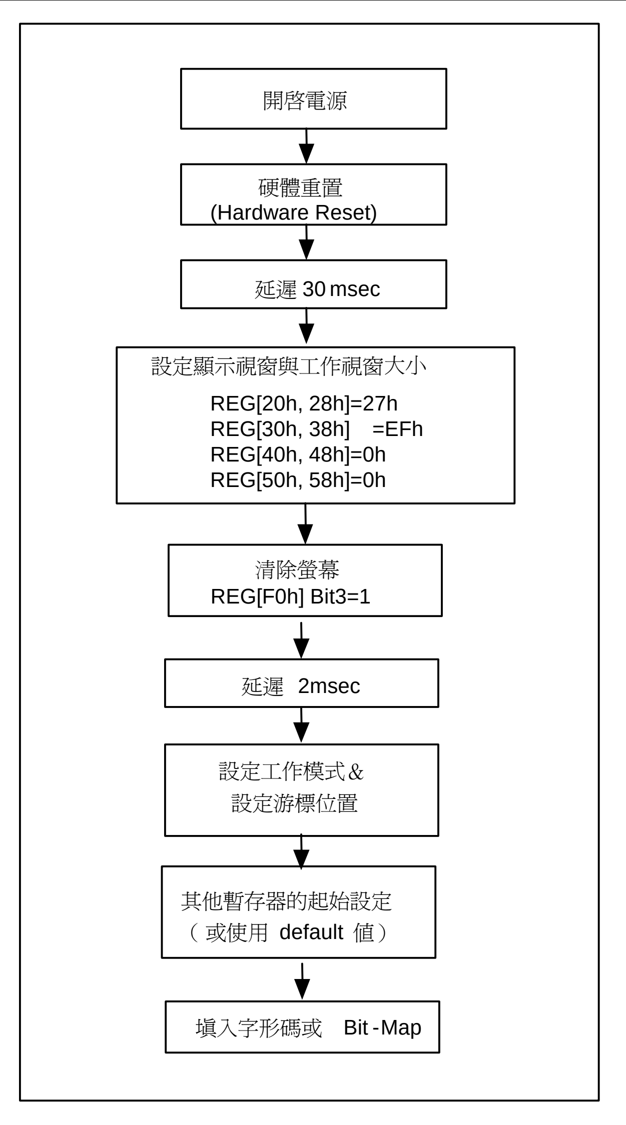
4Bit/8Bit 的 MCU 介面

RA8802 除了支援 8080 和 6800 兩大系列相容的 MCU 介面外，也可以設定 MCU 上的資料匯流排介面是 4-Bit 或是 8-Bit，使用者可以透過 SYS_DB 這根腳位去選擇 MCU 的資料匯流排(Data Bus)介面，如果 SYS_DB 外接一 Pull Low 電阻，則 RA8802 的 MCU 資料匯流排介面將定義成 4-Bit。反之，如果 SYS_DB 外接一 Pull High 電阻，則 RA8802 的 MCU 資料匯流排介面將定為 8-Bit。因為 RA8802 內部的暫存器大多是 8-Bit 的架構，因此如果使用 4-Bit 的資料匯流排介面，MCU 將會花較多的週期(Cycle)去存取 RA8802 內部的暫存器。

當選擇 4-bit MCU 作傳輸模式時，RA8802 的 MCU 介面只有用到資料匯流排的 DB3~DB0，而沒有用到的 DB7~DB4 則必須接 Pull Low，同時每一個八位元的指令或資料將被分為兩個 Nibble(4-Bit)依序透過資料匯流排的 DB3~DB0 進行傳送，第一次先透過匯流排(DB3~DB0)傳送資料的較高位元 Bit[7..4]，第二次再透過匯流排(DB3~DB0)傳送資料的較低位元 Bit[3..0]，使用者可以參考 2.4 節中的例題 5~8。

電源開啟或重置(Power On/Reset)的程序

電源開啓或重置(Power On/Reset)的程序說明，此範例是以 320x240 pixel 爲例子，說明設定方式的流程。



電源開啟或重置的流程圖

■Browse www.topjin.com to down load the LCD drive IC data sheet of RA8803 for more detail .

■Contact us or browse www.topjin.com to get a Sample-Program.

订货信息

型号	DESCRIPTION
TSG240128C00	STN 黄绿屏，正显；6 点钟视角；黄绿背光；带对比度自动调节；外部可调
TSG240128C01	STN 黄绿屏，正显；6 点钟视角；黄绿背光；外部调节对比度
TSG240128C02	FSTN 灰屏，正显；6 点钟视角；白色背光；带对比度自动调节；外部可调
TSG240128C03	FSTN 灰屏，正显；6 点钟视角；白色背光；外部调节对比度
TSG240128C04	STN 蓝屏，负显；6 点钟视角；白背光；带对比度自动调节；外部可调
TSG240128C05	STN 蓝屏，负显；6 点钟视角；白背光；外部调节对比度

Handing Precautions

(1) The display panel is made of glass.Do not subject it to a mechanical shock by dropping it or impact.

(2) If the display panel is damaged and the liquid crystal substance leaks out,be sure not to get any in your mouth.If the substance contacts your skin or clothes ,wash it off using soap and water.
(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the colorto vary.
(4) The polarizer covering the display surface of the LCD module is soft and easily scrathed.Handle this polarizer carefully.
(5) If the display surface becomes contaminated,breathe on the surface andgently wipe it with a soft dry cloth .If it is heavily contaminated,moisten cloth with one lf the following solvents:
-Isopropyl alcohol
-Ethyl alcohol
(6) Exercise care to minimize corrosion of the electrode.Corrosion of the electrodes is accelerated by water droplets ,moisture condensation or a current flow in a high-humidity environment.
(7) Install the LCD Module by using the mounting holes .When mounting the LCD nodule make sure it is free of twisting ,warping and distortion.In particular,do not forcibly pull or bend the I/O cable or the backlight cable .
(8) Do not attempt to disassemble or process the LCD module.
(9) NC terminal should be open.Do not connect anything.
(10)If the logic circuit power is off,do not apply the input signals.
(11)To prevent destruction of the elements by static electricity ,be careful to maintain an optimum work environment.
-Be sure to ground the body when handling the LCD modules.
-Tools required for assembling ,such as soldering irons ,must be properly grounded.
-To reduce the amount of static electricity generated,do not conduct assembling and other work under dry conditions.
-The LCD module is clated with a film to protect the display surface.Exercise care when peeling off this protective film since static electricity may be generated.

Storage Precautions

When storing the LCD modules ,avoid exposure to direct sunlight or to the light of fluorescent lamps.Keep the modules in bags (avoid high temperature/high gumidity and low temperatures below 0^0 ℃).Whenever possible ,the LCD modules should be stored in the same conditions in which they were shipped from our company .
When storing LCDs as spares for some years ,the following precaution are necessary.
(1) Store them in a sealed polyethylene bag.If properly sealed,there is no need for dessicant.
(2) Store them in a dark place.Do not expose to sunlight or fluorescent light,keep the temperature between 0℃ and 35℃.
(3) The polarizer surface should not come in contact with any other objects.(We advise you to store them in the container in which they were shipped.)
(4) Environmental conditions:
-Do not leave them for more than 168hrs.at 60℃.
-Should not be left for more than 48hrs.at -20℃.
Safety
(1) It is recommended to crush damaged or unnecessary LCDs into pices and wash them off with solvents such as acetone and ethanol ,which should later bu bumed.

(2) If any liquid leakes out of a damaged glass cell and comes in contact with the hands,wash off thoroughly with soap and water.

Limited Warranty

Unless agreed between SCH and customer,SCH will replace or repair any of its LCD modules which are found to be functionally defective when inspect in accordance with SCH LCD acceptance standards(copies available upon request)for a period of one year from data of shipments.Cosmetic/visual defects must be returmed to SCH within 90 days of shipment.Confirmation of such data shall be based on rfeight documents.The warranty liability of SCH limited to repair and/or replacement on the terms set forth above.SCH will not be responsible for any subsequent or consequential events.

Return LCM under warranty

No warranty can be granted if the precautions stated above have been disregarded.The typical examples of violations are:

-Broken LCD glass.
-PCB eyelet damaged or modified.
-PCB conductors damaged.
-Circuit modified in any way,including addition of components.
-PCB tampered with by grinding,engraving or painting varnish.
-Soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement.Modules must be returned with sufficient description of the failures or defects.Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet,conductors and terminals.

Others

Liquid crystals solidify under low temperature (below the storage temperature range)leading to defective orientation or the generation of air bubbles(black or white).Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display pattems ,the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear.A normal operating status can be regained by suspending use for some time.It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc,exercise care to avoid holding the following sections when handling the modules.

-Exposed area of the printed circuit board.
-Terminal electrode sections.

USING LCD MODULES

Liquid Crystal Display Modules

LCD is composed of glass and polarizer.Pay attention to the following items when handling.

(1) Please keep the temperature within specified range for use and storage.Polarization degraation,bubble generation or polarizer peel-off may occur with high temperature and high humidity.

(2) Do not touch ,push or rub the exposed polarizers with anything harder than an HB pencil lead(glass,tweezers,etc.)

(3) N-hexane is recommended for cleaning the adhesives used to attach front /rear polarizers and reflectors made of organic subatances which will be damaged by chemicals such as acetone,toluene,ethanol

and isopropylalcohol.

(4) When the display surface becomes dusty ,wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum benzin. Do not scrub hard to avoid damaging the display surface.

(5) Wipe off saliva or water drops immediately , ontact with water over a long period of time may cause deformation of color fading .

(6) Avoid contacting oil and fats.

(7) Condensation on the surface and contact with terminals due to cold will damage,stain or dirty the polarizers.After products ar tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(8) Do not put or attach anything on the display area to avoid leaving marks on.

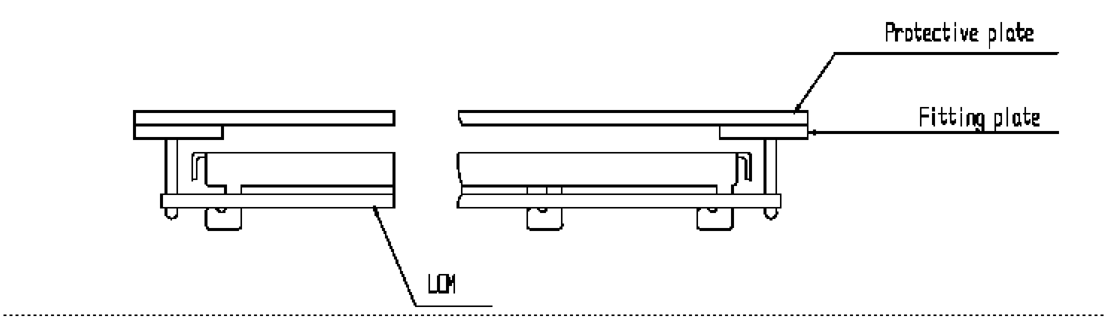
(9) Do not touch the display with bare hands .This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).

(10)As glass is fragile.It tends to become or chipped during handling especially on the edges.Please avoid dropping or jarring .

Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below.Attend to the following items when installing the LCM.

(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



(2) When assembling the LCM into other equipment ,the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface,refer to the individual specifications for measurements.The measurement tolerance should be ±0.1mm.

Precaution for Handing LCD Modules

Since LCM has been assembled and adjusted with a high drgree of precision,avoid applying excessive shocks to the module or making any alterations or modifications to it .

(1) Do not alter,modify or change the the shape of the tab on the metal frame.

(2) Do not make extra holes on the printed circuit board ,modify its shape or change the positions of components to be attached.

(3) Do not damage or modify the pattern writing on the printed circuit board.

(4) Absolutely do not modify the zebra rubber strip (conductive rubber)or heat seal connector.

(5) Except for soldering the interface,do not make any alterations or modifications with a soldering iron.

(6) Do not drop ,bend or twist LCM.

Electro-Static Discharge Control

Since this module uses a CMOS LSI ,the same careful attention should be paid to electrostatic discharge

as for an ordinary CMOSIC.

(1) Make certain that you are grounded when handing LCM.

(2) Before remove LCM from its packing case or incorporating it into a set ,be sure the module and your body have the same electric potential.

(3) When soldering the terminal of LCM,make certain the AC power source for the soldering iron does nto leak.

(4) When using an electric screwdriver to attachLCM,the screwdriver ahoule be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

(5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

(6) To reduce the generation of static electricity be careful that the air in the work is not too dride.A relative humidity of 50%-60% is recommended.

Precaution for soldering to the LCM

(1) Observe the following when soldering lead wire ,connector cable and etc.to the LCM.

-Soldering iron temperature:280℃±10℃.

-Soldering time :3-4sec.

-Solder:eutectic solder.

If soldering flux is used,be sure to remove any remaining flux after finishing to soldering operation.(This does not apply in the case of a non-halogen type of flux.)It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage dur to flux spatters.

(2) When soldering the electroluminescent panel and PC board ,the panel and board should not be detached more than three times.This maximum number is determined by the temperature and time conditions mentioned above,though there may be some variance depending on the temperature of the soldering iron.

(3) When remove the electoluminescent panel form the PC board ,be sure the solder has completely melted ,the soldered pad on the PC board could be damaged.

Precautions for Operation

(1) Viewing angle varies with thechange of liquid crystal driving voltage(V0).Adjust V0 to show

(2) the best contrast.

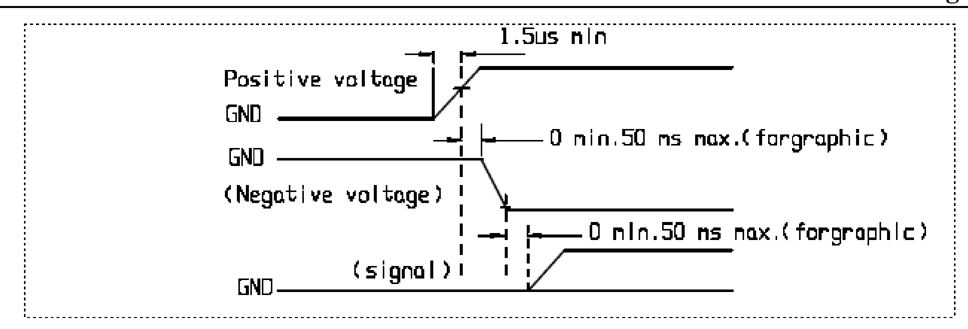
(3) Driving the LCD in the voltage above the limit shortens its life.

(4) Response time is greatly delayed at temperature below the operating temperature range.However,this does not mean the LCD will be out of the order.It will recover when it retums to the specified temperature range.

(5) If the display area is pushed hard during operation,the display will become abnormal.However,it will return to normal if it is turned off and then back on.

(6) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit .Therefore,it must be used under the relative condition of 40℃,50RH.

(7) When turning the power on,input each signal after the positive/negative voltage becomes stable.



NOTICE

- **Operation of the LCM beyond the maximum supply voltage rating may cause permanent damage to the module.**
- **Do not put any large outside force or vibrancy on module，which may cause damage or display abnormality .**
- **Do not touch LCD surface with hands or hard and sharp something, which may cause scratch on polarizer .**
- **Do not clear LCD with any organic solvent; If necessary, moisten cotton with very little dimethylbenzene may be suitable ; adhesive tape is a recommendatory kind of tool to clear dust on LCD .**
- **Do not exceed the storage temprature; and storage humidity below 70RH%; and ESD is necessary .**
- **Do not disassemble the module without TOPJIN Quality Department permission .**

Enjoy our culture of A-OK&SENCERITY&TEAM-WORK&INOVATIVE !